THE VOCAL SCORE PROFILE/VOICE RANGE PROFILE RATIO (P/P RATIO) IN ARTISTIC VOICE EVALUATION: APPLICATION TESTED ON OPERA AND MUSICAL SINGERS

Franco Fussi¹, Nico Paolo Paolillo²

¹Centro Foniatrico USL Ravenna, Teatro Comunale di Bologna, Ravenna, Italy  
²ENT department Mandic Hospital (Merate-LC), Teatro alla Scala, Milan, Italy

Abstract: Performances of unsuited repertories to singer’s vocal and technical features can cause increasing risks of vocal effort (VE) and fatigue or glottis injury (GI), then it’s important to find the right repertory for artist’s vocal and technical features. We made manual voice range profiles (VRP) and interviews regarding performed, studied or not studied roles in professional singers. The dynamic agility (DA) curve, that is the differentials’ curve (note by note) between loud and soft phonation curves of phonetogram, was obtained from VRP. This type of curve allows us to assess the phonation system capacity all range long. We realised for each operatic and musical role a vocal score profile (VSP), that is a statistic method for vocal score semeiotic and accurately highlights the vocal role various musical features through histograms and numeric parameters (1). Then we superimposed the DA graphs on VSP graphs creating a new graph (P/P ratio) that gives a synoptic summary of suitableness of examined singers’ vocal and technical features in regard to considered role, revealing hard and critical moments eventually causing higher VE and GI risks (2). At last we compared data from P/P ratio with those from interviews, valuating correspondence between subjective and objective data (3). This study describes explicative examples of graphs analysis; in all cases analyzed through P/P ratio we found easiness in data interpretation, reliability in suitableness evaluation and expectation, good correspondence between subjective and objective data.

Keywords: vocal score profile, voice range profile, partiturogram, phonetogram, vocal effort.

I. INTRODUCTION

In the clinical management of the artistic voice is important to identify all the risk components of vocal fatigue or glottic damage. The choice of repertories unsuited to technical and vocal features is one of factors that increase the risk of vocal effort and fatigue. For this reason it is essential to predict and to assess the vocal cost in performing a specific role to avoid any risk of glottic damage. We examined opera and musical singers using a method we have developed. The first part of the investigation was to evaluate singers’ feeling about characters’ features making interviews before analysis to assess accordance between subjective feeling and objective analysis, interviews after analysis to evaluate the reliability of a predictive evaluation and an accurate anamnesis to find relationships between the patient’s medical history, such as any vocal desease or phonosurgery, and results of the analysis.

II. METHODS

We used VOCAL SCORE PROFILE, a statistic method for semeiotic of complete vocal score or partitura. It’s made counting presence of notes for each semitone in vocal score using the following scheme (on the top the duration of notes, on the left the tempo). Here is an example regarding the role of Mozart’s Don Giovanni: donna Anna.
It is possible to obtain percentages of presences for every tonal range such as low, middle, passage, high, prevalent octave and comfortable ranges. Here are two histograms for the comparison of the same previous roles.

Using percentage of presence of notes for each semiton, we created an histogram called vocal score profile or partiturogram: below we can observe the tonal range semiton by semiton and on the right or on the left the percentage of presence.

Here we have vocal score profile for donna Anna role. In this case we can note an high presence of middle, passage and high notes, a prevalent octave from A3 to A4 and a little percentage of presence of comfortable range notes. So we can confirm that this is a really difficult role, suitable to a lyric soprano.

Anyway it’s better to consider the Dynamic Agility, which is the value of differential between forte and piano calculated for each tone and allows to accurately value the phonation system capacity all range long. In this case we see a decreasing dynamic agility since middle tonal sector and a worsening in passage and high sectors.

Superimposing the dynamic agility graphs on vocal score profile graphs, we obtain a graph (we called P/P ratio) that gives a synoptic summary of suitableness of examined singers’ vocal and technical features in regard to considered roles, revealing the hardest and critical moments for the singer eventually causing higher vocal effort or injury risks. Below there is the tonal range, on the right the dynamic agility in dB and on the left the percentage of presence of notes.

III. RESULTS
We note that in role critical zones, middle, passage and high ranges there’s an evident reduction of dynamic agility, revealing an high risk of vocal effort. The singers noticed that it’s a difficult role, especially for high and passage notes and is more fatiguing than donna Elvira, the other soprano role in Don Giovanni of Mozart. In singer’s feeling, the first act is easier than the second.

If we analyze graphs for each act we can point out this feeling: in fact in second act there’s an higher presence of passage and high notes, which make the part more difficult than in first act.

Here we have graphs regarding Donna Elvira role: we clearly point out that the lower presence of passage and high notes makes the role more accessible and easier for the vocal features of this soprano.

The lyric soprano previously analyzed has sung Donna Anna role more than 1 hundred times through 3 years on stage in many important theatres under prestigious conductions, sign of a good performance in that role, but with the final result consisting in phonosurgery and a current vocal folds damage.

About Donna Anna and Donna Elvira roles in Mozart’s Don Giovanni, she told us: “Donna Anna requests a certain vocal tract from the first to the second act. The first act is for a lyric soprano with a very dramatic temperament, a quite hard script, always touching a medium-high tessitura and consequently quite tiring. On the other hand the second act is completely different, everything becomes lighter, the tessitura becomes higher and requests a lighter vocal tract. The difficulty is just in finding the right balance, both vocal and physical, between the first and the second act: it is necessary not to give too much during the first act and equilibrate the second act with respect to the first one.

Referring to me, I felt more at my ease during the first act, perhaps also because I have a more full-blooded temperament. In the second act we can say that the thought of the second aria was worrying me a bit; but obviously it is a marvellous part. I played it but at the end I felt a bit tired as if I had being using a bit too much the material and not the interest. On the contrary, during the first act I could even begin without vocalizing because I felt it as being mine. Further on I also sang the role of Elvira and I must say that I really felt at ease because it is a more natural script; it is more similar to the speaking way of a woman while Donna Anna represents the one who extremes the voice. In Donna Elvira both the recitative and ensemble parts are more natural and this because it is always written in a very natural tessitura. On the other hand Donna Anna is continuously in a medium/high-notes voice section also in the ensemble. This meaning that she must always sing in a low voice, in a very low voice. As a consequence who has not extreme facility in that zone can feel some tiredness, with respect to Donna Elvira who constantly remains coherent from the beginning to the end. It is role that must be sung with temperament, with expressiveness but for what was related to the vocal effort, to me the weaving resulted more comfortable”.

Finally we can see here the Phonetogram of the actually most famous coloratura soprano in Italy, Desirée Rancatore, known interpreter of Zauberflute, Die Entführung aus der Serrail, Lakmè, Lucia di Lammermoor, Rigoletto and wonderful Doll in Les Contes d’Hoffmann.

About Blonde and Constance roles in Die Entführung she told us: “The difficulty of Blonde is in the weaving, as it is all central, in the tuned-up, especially those quite lower than Constance.

On the other hand, in the aria she is a pure colour-full soprano, with sudden natural high E. Therefore it is necessary a Pure colour-full soprano to get facility with high notes; while the difficulty is in facing low notes. In Constance the difficulty consists in standing the whole role, because it is long and technically difficult. In my opinion she is not at all a colour-full soprano just to play the role; it is a very dramatic and expressive part. Besides there are two consecutive arias, such as Traurigkeit ward mir zum Loose and Martern aller Arten, which are completely opposite, for one is central,
lyric and sad, while the other in impetuous and dramatically colour-full. In such a case it is difficult to stand the two arias length”.

In the utmost Constanze aria, our soprano has major effort on the high tones C5 and C#5, as she shows lesser differential from the H4 to the D5, and –as a paradox– she shows more differential comfort on the high notes after D5.

The prevalent octave of the role is rather unbalanced towards high notes, in one range (A2–A4) that, according the phonetogram, is more suitable for the singer, both in the aria and even more in the whole role. Besides the singer is at ease in the passage notes and in the well represented centers in the part.

![Image]

IV. CONCLUSION

As a conclusion the relationship between phonetography of a singer and partiturogram of one role, allows us to make some consideration, useful for the singer, about his adequateness to the role itself in function of the larynx muscular effort, phonastenic probabilities, and the forecast of major or lesser rest necessities among the various performances.

We conducted several tests of this type on many singers, 10 opera and 7 musical and we revealed that
- P/P ratio is a reliable method to identify a suitable repertoire and to predict performance risks for vocal effort or glottal damage in performing unsuitable roles.
- In low female voices it’s necessary always to evaluate both low and high vocal registers passages.
- There’s the possibility and reliability of a predictive evaluation, even if without knowledge of subjective feeling
- We can find a relationship between the singers’ medical history, like any vocal disease (even if unknown) or phonosurgery, and analysis results.

It’s very important to underline that a singer with unsuited dynamic agility to a specific role can all the same excel in performing it, even if with a higher vocal cost.

REFERENCES